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National Compensation

The pathway to the concentration of the ironfoundry is certainly not strewed with roses. The situation in the first area to be tackled has reached the stage of discussions between lawyers; the production of draft agreements, amendments; initialling alterations, and so forth. On the manufacturing side, the men in the works to be closed down are not too happy, because they realise that in the near future they will be transferred elsewhere. From a survey of these conditions it is obvious that all these various attempts at local agreements are merely enriching the legal profession, and have every chance of disproportionately benefiting the party employing the smarter lawyer. These are neither ideal nor sporting conditions, and we consider that an entirely fresh start should be made, taking as a basis that the whole industry should be responsible for the compensation of those forced to transfer their businesses elsewhere. To carry this into effect, there is need to ascertain either the output in weight or value over a period to be decided upon, and utilise that as a basis for compensation. To accumulate funds for meeting this demand, resort should be had to a levy on the principal raw material of the industry, namely pig-iron. The small jobbing foundry owner would then at least have the satisfaction of knowing that he was being treated exactly the same as all his colleagues, and would be happier in this knowledge rather than to trust to the best bargain his solicitor can obtain for him. Where a nuclear foundry is taking over two or more concerns, it has already been found that parallel agreements do not satisfy the various lawyers employed. The system suggested ignores, perhaps unwarrantably, the Government edict, that the premises of the closed up foundry must be kept in good going condition and assumes final closure. This has been done, because of the simplification of the problem, but no agreement could or should prevent a firm or an individual restarting in business after a suitable period—sometime later than the conclusion of hostilities—has elapsed. The type of agreement we suggest makes such compensation for closing down of the business only. The actual premises and plant can either stay put or, better still, the latter, if useful, be put into immediate commission elsewhere to aid the war effort. We do not like the prospect of the small jobbing foundry owners being left in the hands of local solicitors, and a really generous move made by the industry as a whole would ensure for them a square deal of a really impersonal character. The initiation of concentration has been somewhat defective and progress limited. The small groups are not at all too happy under the present system of individual agreements, and there is a growing feeling that compensation from a national fund would be preferable. We are assured that the system we have outlined is quite feasible, for it has already been accomplished in another telescoped industry with commendable success. There were some two thousand two hundred ironfoundries in the country before the war, and not a few of them were so small as to resemble a shoeing-smith's shop. In peacetime and in some cases in wartime too, they perform a really useful service, but it must be confessed that in other cases the owner would be better employed as a foreman or manager in a large concern during the present crisis, as more production would result from his efforts. When hostilities cease, he could, with his compensation reinforced by new notions, restart his little shop and resume his local services under better conditions. In other cases, where a brass foundry business is also conducted, he could profitably utilise his compensation to modernise this section. Naturally no two cases are the same, but probably that is all the more reason for the elimination of what will possibly amount to hundreds of agreements by the substitution of a straight cash compensation, based on a nationally accepted agreement.

Contents

National Compensation, 299.—Book Reviews, 300.—Foundry Teamwork, 301.—Future of the Metal Trade, 310.—Spark Testing of Steel Scrap, 311.—Moulded Gear Wheels, 312.—Central and South American Resources, 313.—Brains Trust Queries, 314.—Cupola-Melted High-Duty Cast Irons, 315.—Bearings Control Order, 316.—New Patents, 316.—Obituary, 316.—News in Brief, 317.—Milled Wheaten Substances for Core Binders, etc., 317.—Personal, 317.—No Building Licence for "Process Structures," 317.—David Brown & Sons (Huddersfield), 317.—Company News, 318.—New Companies, 318.—New Trade Marks, 318.—Raw Material Markets, 320.

BOOK REVIEWS

An Engineers' War. By A. G. Thomson. Published by The Engineer & Foundryman (Pty.), Limited, 154, Annan House, Johannesburg, S.A. Price 6s. 6d.

This book has been compiled from a series of articles of outstanding importance which have been running through the [South African] "Engineer and Foundryman," and the whole of the profits are being devoted to the South African Seaward Defence Fund. Dr. H. J. Van der Bijl, the Director-General of War Supplies, in a foreword, refers to limits which the necessity for secrecy have imposed upon the author, yet sufficient has been disclosed to show that South Africa has already built up a large-scale munitions industry, starting from zero. In 1914, engineering in the Union consisted of ship-repairing establishments, railway shops and concerns which catered for the upkeep of the mines. By the time the last war was over, many of the last category had expanded into medium-sized high-grade manufacturing companies. Since then there has been the creation of Iscor, an iron and steel producing plant of considerable and ever-expanding magnitude. This was already giving rise to the formation of secondary industries. For instance, a rainwater goods foundry and a vitreous-enamelling plant have been established. It is at this point that the book takes up the story, and tells of the introduction of real mass production, with its accompaniment of jigs, gauges and fixtures. It is a historic document of considerable importance, for it is probably but a prelude to the post-war industrialisation of the Union. Mining and agriculture will be reinforced by a strong engineering industry well capable of satisfying the needs of vast areas of the African continent. A community of engineers, which has shown such energy, virility of mind, and fixity of purpose, is perfectly capable of adapting munitions plants to peacetime productions. This feature is not stressed in the book—it is confined to the last sentence—but it is one which any reader cannot help but deduce. The last war saw Canada develop on similar lines, to the lasting benefit of the Dominion and of the Commonwealth. As the book is specially written from the foundry angle, it should have a special appeal to readers of this JOURNAL, to whom it is very strongly recommended.

V. C. F.

Steels for the User, by R. T. Rolfe, F.I.C. Published by Chapman & Hall, Limited, 11, Henrietta Street, Covent Garden, London, W.C.2.

The author of this book is a metallurgist attached to a large engineering works, and therefore looks at most problems associated with steel through a different pair of spectacles from his professional colleagues attached to purely metallurgical concerns. It is this factor which makes the book so interesting, for it discloses what is in the mind of the technician, whose job it is to ensure that production and the quality of the output do not descend below a fixed standard on account of the incorporation of defective raw material. The reviewer is thus a little surprised that more stress is not laid on uniformity of quality, for obviously there are fewer headaches in a shop where the quality of the raw materials is consistent than in one where it varies from excellent down to passable. This book is a second edition, the first having been reviewed in our columns on December 16, 1939. The then reviewer made a few suggestions for the improvement of the book, and it is pleasing to see that amendments have been made to embrace these. Generally speaking, the revision has been thoroughly well done. Moreover, very considerable additions have been made, mainly in the direction of weld testing. If a third edition be demanded, it is suggested that the author deletes as much as possible of the material not directly concerned with the technical user of steel, and add, because of rapid growth of mass production, a whole chapter dealing with the necessity for uniformity of quality in consecutive deliveries, and how the user can co-operate to this end. The reviewer of the 1st edition stated that the book was "good"; it can be said of the 2nd edition, that it is very much better.

V. C. F.

Wartime Employment of Women in the Iron and Steel Industry. Issued by the Ministry of Supply, Ashorne Hill, near Leamington.

This little book lists all the jobs which have been undertaken by women in the iron and steel industry, with which is included the iron and steel sections of the foundry industry. From a perusal, we think it would have been easier and quicker to catalogue the jobs still securely reserved for mere man. One little job which has been taken over by the fair sex is that of a pot packer, parenthetically defined as packing "pots into castings"! Another job is that of "foundry clerkess." Whilst it is commendable and highly necessary to have as much work as possible done by female labour, there is no need to mount such an ugly word as a "clerkess." Under suitable conditions practically any unskilled or repetition job which entails lifting weights less than 40 lbs. can be done by women, and those foundries which make the maximum effort to bring this about have a bull-point when the authorities consider their status under any scheme of concentration.

Modern Core Practices and Theories. By Harry W. Dietert. Published by the American Foundrymen's Asociation.

Further to our review of this book in the issue of July 16, we have been informed by the Penton Publishing Company, Limited, 2, Caxton Street, London, S.W.1, from whom the volume can be obtained in this country, that they have been advised by the American publishers that the price of this book is 48s. and not 42s., as stated in our review. The Penton Publishing Company regret that this unwitting error occurred.

"Core and Moulding Sands."—The note of this title on page 256 of our issue of July 9 refers to German activities exclusively.

Fifth Edward Williams' Lecture

FOUNDRY TEAMWORK

By Dr. H. W. GILLETT
(Chief Technical Adviser, Battelle Memorial Institute, Columbus, Ohio, U.S.A.)

Presented with Technical Supplement at the Thirty-Ninth Annual Conference of the Institute of British Foundrymen in London, on June 20

It is an honour to American metallurgy that the Institute of British Foundrymen, after a succession of four Williams' lectures by eminent representatives of British engineering, metallurgy and physics, has selected an American recorder of metallurgical progress to prepare the fifth lecture. The subject of such a lecture should be in tune with the spirit of the man in whose honour the lectureship is established. Lacking any but second-hand knowledge of the personality of Mr. Williams, I may nevertheless make a reasonable guess at what it is like, since it happens that the Director of Battelle Memorial Institute is another C. E. Williams, and he is a metallurgist of Welsh descent. I have not attempted to make a genealogical investigation to find out if these two C. E. Williamses have common ancestors. I have been able to trace the pedigrees of my English setters, far back to English ancestors among the early Laveracks, Llewellins, Mallwyds, O'Lecks, etc., but tracing the Williams' clan is not so simple.

As I see it, a Welsh foundryman named Williams is likely to be extremely interested in science, in research, and in engineering development, but not at all satisfied with the mere existence of unapplied knowledge in these lines. His most vital interest is likely to be in getting those advances translated into actual practice.

Fostering the Team Spirit

In his presidential address of 1933, Mr. Williams referred to "the team spirit which the Institute of British Foundrymen exhibits and fosters in a very special degree," and further stated: "The Institute is a medium through which the team spirit is linked with other nations." He pointed out that "a spirit of good fellowship and mutual helpfulness creates an atmosphere in which progress can thrive." Hence, I have felt that an account of teamwork in its application to foundry matters, with emphasis upon the "atmosphere" favourable to co-operation and progress, is a fitting tribute to Mr. Williams, and in line with the interests of the Institute of British Foundrymen.

Sir Lawrence Bragg in the 1939 lecture quoted Sir Josiah Stamp as saying: "Knowledge is being mined in laboratories, and buried in periodicals." Research men are accustomed to digging up this "buried" information, but few operating men are so accustomed, nor do they have the time. Moreover, it is a psychological fact that one is more likely to appreciate and to use information that he mines himself, or pays to have mined, so that he has a personal and proprietary interest in it, than he is to appreciate and use second-hand information.

Even if the operating man does find time to read the information buried in technical articles, too often the hints contained in them are not put into practice. They remain merely as interesting abstract statements of what somebody else does, not to be tried in one's own plant until some dire emergency forces a hasty trial as a last resort.

The trouble with industrial research does not lie so much in lack of facilities, in any industrial nation, for development of facts by research, or in means for spreading those facts on the public record. The pages of the transactions of technical societies, and of other technical journals, are nowadays overwhelmingly filled with the results of research. It is in the step of assimilation and utilisation of the results where the big gap occurs. Mere publication does not insure utilisation. One might apply the admonition, "Ye know these things, blessed are ye if ye do them."

You recall the story of the ship off the mouth of the Amazon that was out of water and, in great distress, hailed a passing ship for replenishment. The reply was, "Throw down your bucket where you are." The point of the story is that you have to have a bucket. Published information is as free as water, but it has to be swallowed before it will quench thirst.

Applied Knowledge Counts

In "Metal Progress" for January, 1942, a correspondent asked for information on the use of light sheet steel scrap in the cupola. The reply says to bundle the scrap under high pressure, but concludes: "It is suggested that the services of a professional metallurgist in your district be obtained, one who has had practical experience in foundry production as well as theoretical knowledge. Cast iron is one of the most complex

Foundry Teamwork

among metals, and no book, article, or letter can do more than point out the general principles upon which to build. There are, for example, many books on medical practices, yet it usually is smart to get a doctor"! In this connection, it is better to have a family doctor, who steadily keeps a watchful eye over you, than to call in a specialist only when you are very ill.

Besides the published facts, there's another reservoir of information. This consists of the little tricks and kinks of saving of labour and materials, or for improvement of quality, that have been worked out in individual plants, but never get recorded in technical literature. Each appears too minor to justify building a technical article around it; moreover, the operating people who devise them are doers, not writers. The total of little tricks, however, can readily add up to a sum sufficient to swing operations from the loss to the profit column in peacetime, or to give a worth-while increase in production in wartime. Swapping information and experience, that is, co-operative attack on the common enemies, ignorance of facts, and ignoring known facts, is extremely logical in theory, but none too easy of accomplishment.

The Personal Approach

The U.S. Department of Agriculture has for many years spent huge sums in investigations for the benefit of the farmer, and has recorded the facts so found in bulletins that he can get for the asking, yet the degree of application was very small. The farmer helped to pay, through his taxes, for the accumulation of facts, but since taxes go for all sorts of purposes, he did not fully realise that he had, himself, paid good money for those facts. In order to get sufficient application of the facts, it was necessary to bring them to the farmer in a more direct and personal way, through "county agents" who visit each farmer, discuss his own operations in the light of his particular and local needs, and point out applications made by his neighbours. An interpreter is required who can both speak the local dialect and understand what he is trying to interpret. In the agricultural field, this direct, personalised approach has brought far better results than the mere distribution of pamphlets, but the method still falls short of the ideal because of its paternalistic aspects. If the farmers of a county, or the progressive fraction thereof, banded together to hire a qualified interpreter and paid him direct, rather than through taxes, his service would be far more appreciated and his suggestions more quickly utilised, than is the case with the governmental set-up.

Swapping Practical Experience

Transferring our thought to any commercial analogy, and particularly to the foundry industry, another bit of basic psychology comes in, especially when it is part of the plan to pass on from one to another the minor operating kinks developed in each shop. This neighbourhood group should not be such close neighbours that they serve the same customers, and hence are active competitors. That factor is of no importance in wartime, with the Government the only purchaser, but it is of major importance in peacetime, and if such a coalition were set up in wartime, it would fall apart in peacetime unless the condition of non-competitiveness has been met.

If the group confines its joint attention to fundamental questions of equal interest to all and does not attempt to deal at all with the swapping of the operational details that go to make up whatever advantage one shop has over another, then such a coalition, even of active competitors, may be workable, but its scope and value are limited. Sometimes it is to the advantage of the more progressive in such a group to help out a newcomer or a weak sister, even though a direct competitor, in the case where the competitor is making so low a quality of product as to give that product a bad name among ultimate consumers, so that assistance on quality control may readily be given, when assistance on reduction of operating costs would be withheld.

Competition Incites Co-operation

Just as attack by a common enemy wipes out pre-existing selfishness and welds a nation together into a normally unattainable degree of co-operativeness, so competition among materials and manufacturing methods incites co-operation among those dealing with a given material by a given method. Welding, forging, even powder metallurgy, are developing under wartime pressure as strong competitors of castings; plastics likewise will offer competition in limited fields. Within the foundry industry, aluminium and magnesium, whose production has been so vastly increased, will be seeking larger use on the basis of reduced cost of those raw materials. Grey iron, malleable iron, cast steel, and the copper-base alloy castings will increasingly be under attack by other materials and other methods of fabrication.

This is fine from the point of view of the general public, for it leads to better and cheaper materials of engineering. But if no defence is put up by bettering and cheapening the old-line foundry products, the shareholders and the workmen of the old-line foundries will not be the outstanding beneficiaries of postwar industrial activities. Under

Foundry Teamwork

such outside pressure, teamwork, even among active competitors, to preserve their industry as well as the individuals therein, is favoured, since the psychology created by the situation bears some similitude to wartime psychology.

Co-operation among American Metallurgists

A variety of co-operative organisations has grown up in American metallurgy through which the basic problem of the dissemination and application of information from one to another is attacked. Mention should perhaps first be made of the work of sales engineers who travel from one plant to another to lay a technical basis for the sale of a particular alloying element, piece of equipment, sand binder or anything else. Difficulties met in the application of what he has to sell are often smoothed away by tactful suggestions upon operating conditions that are not up to par, and thus handicap the proper use of what he is trying to introduce. Competent engineers, even though they class as salesmen, are welcomed in the plants, and they do succeed in helping a good many customers. Naturally, their advice is limited in scope and may be a bit biased. Anyhow, it is only advice, which the plant has no great incentive to apply.

Most American metallurgical societies originated from the desire of operating men, superintendents, and foremen to get together and exchange information. The Papers presented in the early days dealt with highly practical topics, and the discussion was entered into by the practical men. As time went on, the Papers tended to become more of a theoretical, or at least of a highly advanced, nature, which only the specialist can appreciate, and convention programmes became so crowded that there was no time for adequate discussion. The American Foundrymen's Association has probably succumbed to this trend less than most other societies, but has a constant struggle to maintain a flow of practical Papers.

Value of Discussions by Small Groups

A national society is too large to handle the problem adequately at its annual meetings, so there is an increasing tendency toward local sections and regional meetings where the less formal atmosphere facilitates presentation and discussion of practical topics, but such meetings cover a variety of topics and seldom do more than skim the surface of any one topic.

Smaller organisations of operating men who have like problems fill a need not otherwise met. Outstanding among these is the "Open Hearth Conference," held annually under the auspices of the American Institute of Mining and Metallurgical Engineers. This has been run as a closed corporation, only those directly concerned with making open-hearth furnaces work have been admitted to the conferences. Similar conferences of operators concerned with blast furnaces and raw materials are now held at the same time, since all the problems are related. Naturally, the attention of these conferences is primarily directed to the operation of open hearths making steel ingots, rather than castings, though the latter are not entirely neglected.

A registration fee is charged those who attend, large enough so the expense of the meeting and of printing the record is covered. Although sponsored by the A.I.M.E., it operates quite independently, is self-supporting, and the report of the annual conference is privately distributed, not to the general A.I.M.E. membership. Nor does one need to belong to the A.I.M.E. to join the conference. Operating details, experiences with new refractories, control instruments, etc., are discussed with the greatest freedom, each one feeling that, on the whole, over a period of years, he gets much more from the accumulated experience of others than he himself gives. There was an attendance of 750 at the 1941 conference.

The chances that a kink reported by a practical man, whose ability and common sense are respected, will be tried out after hearing his own first-hand colloquial statement of his experience, are far greater than if the same thing had merely been published in highly dignified language and had been read, instead of heard.

Another group is the Electric Metal Makers' Guild, also a closed corporation, consisting of superintendents, foremen, and electric furnace melters, who similarly exchange experiences. The psychology of the term "Guild" may have much to do with keeping the organisation on a very practical basis.

Steel Castings Groups

The steel-castings industry in the U.S. has several organisations, notably the American Foundrymen's Association, which, of course, deals with steel as well as with all other cast materials, and the Steel Founders' Association, with rather similar aims confined to steel. In both cases, the large number of foundries belonging necessarily makes the activities of a general, rather than a specific nature.

A couple of very interesting small groups existed in the steel-casting industry a few years ago. These were the Electric Steel Founders' Research Group, under the technical direction of the late Major R. A. Bull, and the Steel Castings Develop-

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Foundry Teamwork

ment Bureau, under that of the late George Batty, who brought to bear his previous English experience. Both these groups were small, made up of half a dozen or a dozen steel foundries geographically so situated, or specialising in such different types of castings, that they were not active competitors. The basic idea of these groups was that each plant gained experience that could be interchanged through the medium of very frequent visits by the technical director, as well as by periodic meetings of the executive and operating staffs of the constituent plants. Each plant did a considerable amount of research and development work, the expense of which was considered a part of the co-operative arrangement. The results of such investigations were available to all and could be immediately put into operation in the other plants, since the technical director knew just what "bugs" had had to be worked out in the one plant, and could avoid them when another plant was ready to use the information.

That these groups did not formally survive long after the deaths of Bull and Batty is no evidence against the efficiency of such a group. It is evidence that the technical director of any such alliance is the mainspring, and that men of suitable experience and personality for such a task are *rare aves*. They need the background of operating experience that begets confidence in their appraisal of the situation. It costs money to get such men; it takes time of executives and operators to meet with them on their periodic visits. But, just because they are investing money and time, the managements of the member plants are prone to use, rather than pigeon-hole, constructive suggestions.

Grey Iron Groups

In the grey-iron field, the American Foundrymen's Association, and the Gray Iron Founders' Society, deal with problems of the whole industry. The number of local sections of the A.F.A. has grown rapidly, and the Association sponsors several "regional meetings." In these meetings, smaller than the annual convention, operating problems are often discussed.

A smaller group makes up the Meehanite Research Institute, consisting of some 15 licensees of Meehanite patents and presided over by Mr. Oliver Smalley. As there is a similar group in the British Isles, you are familiar with its operations. It appears that much of the strength of the organisation lies in the aid given to member foundries on general operating matters.

Another small group, intentionally kept small, is the Gray Iron Research Institute, in whose formation the psychological factors affecting co-operation were carefully considered. The "specifications" for such a group were: Co-operative attitude of management and operators; geographic location such that all plants may be readily visited, but separated sufficiently so that the plants do not compete in serving the same commercial customers, or, alternately, if located near each other, plant specialisation in type of castings to be such that competition is minimised (the plant capacity ranges from 30 to 1,200 short tons per day); number restricted to about a dozen so that the technical field staff may make at least one two-day visit each month.

Scheme of Co-operative Field Work

The plan calls, first, for application of known facts; second, for finding of new facts specifically needed by the group, *i.e.*, what might be called "selfish research," aimed at actually existing needs and designed for immediate practical application. In operation, a field crew visits the member foundries monthly, watches the foundry operation, particularly as to the working out of suggestions previously made, and talks over that foundry's problems with management and operating staff, meeting jointly. Representatives of other member foundries often go along during these visits in order to pick up details of operation at the plant visited, which the field crew has appraised as applicable to the visitor's foundry.

The field crew consists of a leader, technically trained, and with a long and varied operating experience. The leader is not himself a laboratory research man, but is used to applying the results of laboratory research, and to carrying out plant research and development. He is assisted by several research engineers, technically trained and having had operating experience prior to engaging in research. Needless to say, technical ability in this crew must be coupled with tact, but also with a complete lack of respect for a way of doing things just because they have always been done that way, unless that way happens to be the best way under the existing conditions. It also has to consist of the sort of people who will come in at 2 a.m. to watch the lighting of the cupola, when the field work makes such observations necessary.

Anything and everything relating to improved production, decreased cost, or improved quality is within the scope of the attention of the field crew Study of waster castings and the causes that led to them, matters of sand control, design of better facilities for mechanical charging, appraisal of available cokes, sorting and sizing scrap, application

of " late additions " for production of high strength iron, methods of instrumental control and temperature measurement, ladle linings, sulphur removal, and a thousand and one minor details make up the whole. Great attention is paid to introduction in other member foundries of any little kink that has been proved in any single one.

Battelle Foundry Research

This field work is backed up by research work in the experimental foundry at Battelle Memorial Institute, where problems are studied up to the point where it is justifiable to try out a seeming answer to a member foundry, or whether the studies would too greatly interfere with production, if made in the plant. A great variety of complex " late additions " have thus been given laboratory study so as to simmer down the plant trials to those additions likely to be of most value for the particular type of iron required by the particular type of castings of a particular foundry.

One case was found where late additions were being made to a very heavy casting which froze so slowly that the effect of the addition was dissipated before freezing so that the addition was valueless. Just leaving out the addition saves that foundry the equivalent of £900 per year. Infrared heating for mould drying has been appraised and its installation advised where applicable.

Humidity control of the blast was studied in the cupola of the experimental laboratory. A commercial installation is under way in a member plant. Instrumental control of the laboratory cupola was worked out with the object of selecting portable equipment for a complete evaluation of all factors of cupola operation. This equipment (Figs. A and B) was in turn taken to each member foundry, and a representative cupola in each put through a complete test. Lack of needed control equipment, failure to replace worn-out equipment, methods of operation falling short of the best, etc., etc., that limited the production of good, hot metal, were thus revealed. The productivity of several foundries has thus been materially improved. In order to facilitate operation, a study of cupola blast control was made in this case by Battelle instead of by the G.I.R.I., but distributed to G.I.R.I. members. In order that this lecture may contain something beside non-technical generalities, a report by Herres and Lorig of this work, hitherto unpublished, is included as a technical supplement. Credit for this belongs to them, not to me.

Need of Communal Briquetting Press

A possibility, not yet utilised by this or other co-operative grey iron groups, that should be helpful in certain localities, is the installation of a briquetting press for grey iron or steel chips, owned jointly by foundries situated near each other, to which the chips from local machine shops are taken for briquetting and from which the briquettes are sent to the cupolas of the owners. The use of briquettes for reclamation of their own machine shop chips has worked out finely in several very large plants whose output is great enough to keep the press working. Many farming communities in the U.S. employ group-owned, tractor-drawn corn harvesters and soya bean harvesters, which are kept busy during the harvesting season. No one small farmer could economically own such a machine, which he would use only a day or two a year. The same principle should apply directly to joint ownership of a briquetting press.

The efficacy of such a campaign for improved operation depends on the face-to-face personal transmission of facts, methods, and experience from one plant to another and from the laboratory to the plant. It accomplishes more than the mere reading of technical articles, or listening to talks at conventions, can ever be expected to do. The desire for application of useful information comes from within the membership, and the presence of that desire is a *sine qua non*—not even government agents can effectively force such aid on unreceptive operators. The fact that the co-operative work comes from the inside and costs money, instead of coming as free advice proffered from outside, is in accordance with sound psychology.

Small Co-ordinating Groups Essential

Any such group must be kept small enough so that the efforts are not spread too thin. The tendency in laying plans for improving practice in an industry is to take in too much territory, so that the effort is thinly spread. Localised, concentrated effort, applied to those portions of the industry that are in the most receptive mood, is more effective. Qualified co-ordinators are few. While others are being trained, the efforts of those few should be exerted where they will have the greatest effect. The advantage of small groups, the " divide and conquer " principle, can hardly be overestimated, and there is no limit to the number of such groups that might be set up; one could make many castings off this pattern.

This type of co-operative reseach, in which the application of what is already known takes precedence over the finding of new facts, and in which the search for new facts is aimed directly at finding out just what one needs to know at the moment, is relatively infrequent. It is very common within single, large industrial organisations

Foundry Teamwork

that have active research and development groups of their own. Indeed, co-operative work by such a group can be looked at as paralleling what is done by single large firms with several manufacturing branches. Conversely, it can be viewed as a means of putting the technical progress of a number of small plants on a par with that of a large corporation, without shift in financial control.

The type of organisation of the Gray Iron Research Institute represents a practical degree of subdivision in co-operative effort and applies especially to industries with so many members that a coalition of the whole industry is too unwieldy, except for the all-embracing activities of a national technical society, which perforce has to deal almost solely with knowing rather than doing. There is, however, an in-between stage where co-operation within a specialised branch of industry can be effective, even if confined solely to acquiring needed knowledge.

FIG. A.—EQUIPMENT FOR MEASURING AIR DELIVERY TO CUPOLA AND FOR DETERMINING COMPOSITION OF STACK GAS.

A: Recorder for per cent. relative humidity and dry bulb temperature (Friez).—B: Aneroid barometer.—C: Gum rubber tubing for connecting Pitot tube with meters.—D: Flowmeter, 0.2 in. water differential meter to use with Pitot tube.—E: Inclined manometer to use with Pitot tube. Reads in in. water using xylene as fluid.—F: Thermometer for air blast temperature.—G: Recording pressure gauge 0.48 oz./sq. in. Used with Pitot tube if installed in pressure side of blower.—H: Stopcocks and capillaries to use with Pitot tube and manometer.—J: Pitot tube—impact and static openings.—K: Revolution counter and stop watch for checking speed of blowers.—L: Tool box, flashlight, rules, gas sampling pipe and drill for drilling holes in blast pipe to accommodate Pitot tube and thermometer.—M: Orsat apparatus for determining CO_2, CO, and O_2.—N: Data boards with watches having sweep second hands.—O: Dwyer rapid CO_2 apparatus.—P: Aspirator and filter for stack gas sample.

Non-Ferrous Bearings Research

A case of this sort occurred several years ago when a half-dozen of the larger makers of bronze bearings, although strong competitors of each other, banded together into "The Non-Ferrous Bearings Research Group" and undertook, with the aid of the Copper and Brass Research Association, to determine more accurately the mechanical properties of the important bronze bearing alloys. Each plant's own test records were correlated with all the others, and where gaps occurred or discrepancies showed up, each alloy was made up in several foundries and tested at Battelle. While it was recognised that the mechanical properties themselves have little necessary relation to the properties upon which bearing performance depends, finding out what ranges of mechanical properties existed in the castings was considered worth made by each member, while. If the practice of one plant on one alloy gave results below the average, that plant could and did examine and improve its practice. This group was set up for the one purpose only, was not planned to be permanent, and disbanded when it had accomplished its object. The results were published.

Foundry Teamwork

Another case is that of the Alloy Castings Institute, consisting of some 20 foundries producing more than three-quarters of the output of heat-resistant and corrosion-resistant castings. This group is, in its co-operative effort, not directly concerned with operating practice, but rather with filling the gaps in the needed facts. Members of this Institute are, in general, active competitors, and Institute activities do not extend to any formal exchange of details of operating procedures. The needs felt by each foundry were for more precise information on the properties and applicability of the various more or less standardised compositions called for by the trade, for consistent methods of testing, and for development of alloys with better combinations of properties.

Standard Test-Bar Practice

In the course of the co-operative research, carried out at Battelle Memorial Institute, a standard practice was adopted for making test bars, in the course of which each composition to be studied was made up by several foundries in order to establish the expected commercial range of properties. Incidentally, any foundry whose practice, as shown by this comparison, was not up to average on any particular alloy immediately took steps to improve that practice, just as happened in the case of the bronze bearing alloys. Much work was done to establish the short-time high temperature and the long-time creep properties of the heat-resistant alloys; gaps in the knowledge of corrosion resistance of the corrosion-resistant alloys were filled; means for improving machinability of the latter were found; and a long study of the proper balance of composition in the 25 Cr 12 Ni type of heat-resistant alloy for a combination of strength and retention of ductility in service, proved fruitful. The Patent on the balanced composition has been made available without royalty, for the period of emergency, to non-members. Much of the information that has accumulated has been published.[1]

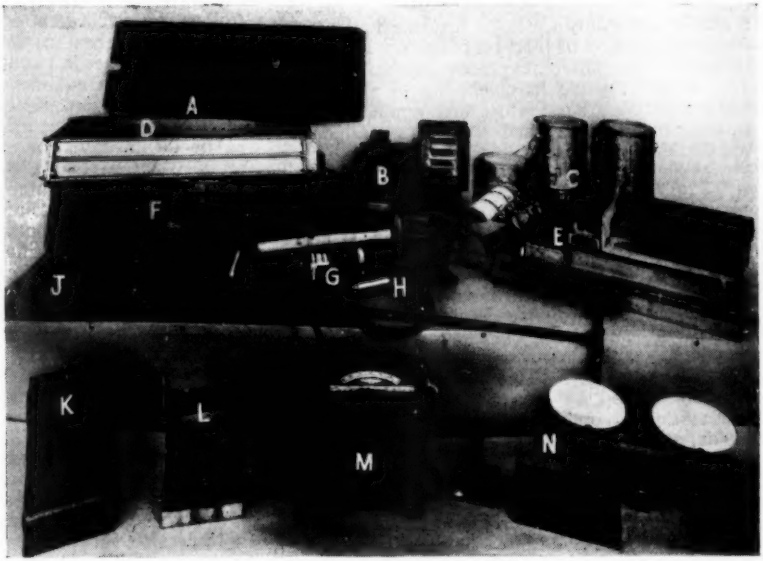

FIG. B.—EQUIPMENT USED FOR TESTING THE IRON.

A: Pattern for two 1.2 in. dia. by 21 in.—B: Core boxes.—C: Alloys for making inoculation tests.—D: Jacket (5 used).—E: Recording dilatometer with cores for determining expansion and contraction of iron while cooling.—F: 20 in. by 28 in. slip flask.—G: "Pyro" optical pyrometer.—H: L. & N. optical pyrometer.—J: Hand ladle for taking iron samples.—K: Water cooled chill and test cores.—L: Chill and core with ½-, ¼-, ⅛-, 1/16-in. sections for chill test.—M: Counter.—N: Balance and weights for weighing alloys.

A by-product, arising from the interest aroused in the corrosion work for the Alloy Castings Institute, was the development by Battelle of a simple

[1] Harder, O. E. "The Alloy Casting Research Institute Test Block for Heat-Resisting Alloys," Proc. Am. Soc. Test. Materials, Vol. XXXIX 1939, pages 626-636. Gow, J. T. and Harder, O. E. "Balancing the Composition of Cast 25 Cr 12 Ni Type Alloys," Preprint No. 21. Am. Soc. for Metals, 1941, 65 pages. Prav, H., Peoples, R. S., and Fink, F. W. "Addition of Bismuth for Producing Free-Machining Stainless Steels," Preprint No. 29, Am. Soc. Test. Materials. 1941. 10 pages.

Foundry Teamwork

method[2] of determining the susceptibility of austenitic corrosion-resistant alloys, to intergranular attack, using the principles of electrolytic polishing.

When, in the pre-war "defence" and lease-lend preparation, it became necessary to limit the use of nickel, the Alloy Castings Institute had a firm enough foundation of facts on properties and applicability of the different grades of heat-resisting alloy, to let it guide its customers to application of lower nickel grades, when such application was justified, and to steer them away from attempted substitution in the limited cases where it was not.

"Non-Ferrous Metals Institute"

Another organisation of interest to the foundry trade is the Non-Ferrous Metals Institute, a group of refiners making secondary copper-alloy ingots, with Dr. G. H. Clamer as a prime mover in its activities, which has long maintained a Research Associate at the National Bureau of Standards for the study of the effect of impurities on such alloys, and which has sought to cut down the number of compositions presented to the trade to the minimum required by the real technical facts. Similar interests tie the makers of secondary aluminium alloy ingot together into the Aluminium Research Institute.

In any co-operative effort it has to be recognised that folks are folks, and that different folks have different ideas. In the face of problems that effect each equally, despite their different ideas, folks can be brought together to pool the ideas and solve the problems. In time of war, anyone with knowledge useful in furthering the war effort is ready and eager to share it, even with his erstwhile most serious competitor, and even though the knowledge would normally be held as a commercial secret. Under dictatorial *régimes*, some approach to such sharing can be forced from above at any time, but that method cannot be applied to individualists of democratic countries in peacetime; nor should it be. The urge to do things in new and better ways is intensified when one may profit thereby, diminished when he may not. Of course, it may be, and often is, good policy to throw secrecy overboard and publicise the advances made, from a strictly commercial attitude, irrespective of altruistic motives. But, on the whole, enlightened self-interest, with private ownership of processes in normal times, pooling under stress of emergency, has led to greater progress than has abstract altruism. We need to combine the driving force of self-interest with a voluntary use of the principle of sharing.

Co-operative Efforts Practicable

Enlightened self-interest leads to the conclusion that if, in a group, each one can exchange a bit of his own knowledge and experience with his follows for two or three bits, each of equal value, everyone is ahead. Co-operative effort among those of like needs has been proved to work, provided a few fundamental principles of human nature are not transgressed. Co-operative research, in practice, is quite as much a matter of psychology as of technology, but experience has shown that foundrymen are sufficiently reasonable creatures, so that co-operation among them is feasible in the U.S.A. Current events are proving beyond a doubt that there is no essential difference between the average man in the British Commonwealth and the average man in the United States; both react in the same way to the same stimuli. Indeed, our British cousins are, in their co-operative attack on broad technical problems of the steel industry, in heterogeneity of steel ingots and allied topics, for example, carrying out a larger and more comprehensive joint investigation than anything attempted in America.

In the foundry field, the British Non-Ferrous Research Association and the British Cast Iron Research Association, with their central laboratories, are producing information of the greatest value, not only in respect to physical metallurgy, but also in respect to foundry practice. No exact analogy to these activities, in which so many different firms co-operate, exist in the U.S., perhaps primarily because of the greater distances at which the plants are located.

"Faith without works is dead"

From the point of view of real progress, it is quite as important to put facts to work, by whatever means best suit the case in hand, as it is to get facts. Research without application is worthless—"Faith without works is dead." The means best suited for application will vary—no previous scheme can be guaranteed to fit a new set of conditions, no matter how well it worked in the previous case. Yet the fact that a plan has worked may well lead us to examine the conditions under which it worked. Perhaps we have only to thicken the bosses on the pattern just a bit in order to use it for another casting.

In *developing* new, fundamental information, the greater the number of co-operators and financial supporters the better, but in *applying* new or old information there seems much virtue in quite small

[2] Russell, H. W., Pray, H., and Miller, P. D. "Simple Method for Detecting Susceptibility of 18·8 Steels to Intergranular Corrosion." Metals Tech., Vol. VIII, September, 1941, 12 pages.

groups, small enough to allow intensive effort. American experience with small groups is so encouraging that it has seemed in order, in discussing teamwork in general, to stress, especially in respect to the foundry industry, the apparent suitability of the small, closely-knit team for easy utilisation of that "team spirit" which Mr. Williams aptly characterised as vital for progress.

APPENDIX I

Explanatory Notes to Figures

Many of the smaller items shown may appear superfluous, but yet all of these items are essential in making the tests. It is undesirable and unsatisfactory to depend on the foundries giving much help in installing the equipment and operating it. Hence, the tests are run by two men of the test crew, one at the cupola spout and the other on the charging platform. Details of the equipment in Figs. A and B are:—

Notes on Fig. A

Friez recorder, with 30-hr. movement recording per cent. relative humidity (hair hygrometer) and dry bulk temperature. The instrument is placed near blower intake.

Flowmeter, a diaphragm type with an 8-hr. clock driven chart, made by Republic Flowmeter Company. This meter is used with the Pitot tube, the impact opening being located at the centre of the blast pipe. From the record obtained, and knowing the density of the air at the point of measurement and the cross-sectional area of the pipe, the air flow can be calculated. It is usually necessary to apply a correction to the centre point velocity. This correction factor is found by measuring the velocity of the air at 10 points across each of two diameters at 90 deg. to each other.

Recording Pressure Gauge, bellows type, made by Bristol Company having an 8-hr. clock-driven chart. If conditions are such that the Pitot tube can be installed on the intake side of the blower, the pressure gauge is connected to the wind box, but if the Pitot tube is installed in the blast pipe, then the pressure gauge is connected to the static connection of the Pitot tube.

Orsat Apparatus (Hayes), used about every half hour for checking CO_2 and O_2.

Dwyer CO_2 Indicator.—This instrument's operation is based on the Orsat principle. Complete CO_2 determinations can be made in less than 1 min.

Barometer.—Placed near blower intake.

Inclined Manometer.—Used with Pitot tube to make velocity survey across blast pipe. Stopcocks and capillaries are necessary to control fluctuation in height of liquid column in manometer. Other equipment shown is self-explanatory.

Notes on Fig. B

Coreboxes for chill test cores, slag samples, recording dilatometer and strainer core for mould. Test bars are cast in green sand. A fireclay bonded synthetic sand having the following properties is used: Moisture, 3 to 4 per cent.; A.F.A. permeability, 90 to 110; green compressive strength, 4.5 to 7 lbs./sq. in.

Recording Dilatometer.—Battelle design on principles adapted from Dawson contraction test apparatus used at Stanton Ironworks, Limited.

Pyrometer.—Two pyrometers are used and frequently checked against each other, as it is unlikely that both of them will lose their calibration at the same time. The "Pyro" is more convenient to use.

Alloys.—75 per cent. ferro-silicon, and two proprietary alloys. No attempt is made in the field survey to evaluate the merits of the alloys, but only to check the response of the iron to inoculation. The results obtained are often quite surprising, due to their effectiveness in improving the properties of one iron and then again having very little effect on some other iron.

Miscellaneous Items.—Chalk for hot marking of test pieces, numbers for marking moulds, hammer for breaking chill test pieces, etc.

PRESENTATION OF LECTURE

The Fifth Edward Williams Lecture was presented by Mr. J. G. Pearce, M.Sc., F.P.S., Director of the British Cast Iron Research Association, on behalf of the author, Dr. H. W. Gillett. At the outset, the President read a letter from Mr. C. E. Williams, who regretted that he was unable to attend the conference, but expressed his best wishes for its success and his gratification that the Lecture was concerned with a subject which he had so much at heart.

MR. PEARCE, at the conclusion of the Lecture, said it had been a pleasure to him to present it, for he had had the opportunity of discussing the matters dealt with therein with Dr. Gillett at the beautifully designed and sumptuous laboratories which were his headquarters at Columbus.

Vote of Thanks

MR. V. DELPORT (European Representative of

Foundry Teamwork

the American Foundrymen's Association, and a Past-President of the London Branch) had the privilege of proposing a vote of thanks to Dr. Gillett for his Lecture, and to Mr. Pearce for having presented it. As one who was in close touch with American friends, he said he was in a position to state, from his correspondence with them, that they had the strongest desire to help and to co-operate with this country in every activity connected with the war. Even before the United States had entered the war he had received many letters of sympathy from America, particularly at the time when London and other large cities in this country were targets for the enemy's bombs. Mr. Pearce and Mr. Makemson, from their correspondence with American friends, could confirm this.

The members of the Institute had had the opportunity of hearing and reading the Edward Williams Lecture prepared by a representative of the A.F.A., and they would all agree that Dr. Gillett had made a happy choice of subject. The Lecture emphasised the desire for teamwork, not only in the industry, but in connection with the war, and no subject could have appealed more to the members of the Institute. It was the sincere hope of all that the teamwork, which was becoming stronger, between our friends across the Atlantic and ourselves would continue after the war, and would assist in the making of an equitable peace. In thanking Mr. Pearce for the presentation of the lecture, he said the close ties and associations existing between the leading research workers in this country and the United States, such as himself and Dr. Gillett, were of the utmost importance.

MR. G. L. BAILEY (British Non-Ferrous Metals Research Association), seconding, said he was glad of the opportunity to join in the expression of thanks to Dr. Gillett and Mr. Pearce, for several reasons in addition to those mentioned by Mr. Delport. Dr. Gillett, he said, had produced recently a series of very important and extremely interesting reports on various matters connected directly with the war effort; the fact that he had found time to prepare the Edward Williams Lecture indicated how willing and anxious he was to co-operate with the Institute. He was extraordinarily able, always presenting his thoughts and information in such a way that the reader must digest them; the Institute was extremely fortunate in the fact that he had prepared the Lecture. In thanking Mr. Pearce, he said that the masterly manner in which he had presented the Lecture on behalf of the author, at very short notice, and had emphasised the salient points, commanded the admiration of all who had heard him.

The vote of thanks was carried with enthusiasm.

MR. PEARCE, in a brief response, joined with Mr. Bailey in the expression of admiration of Dr. Gillett's unconventional approach to metallurgical matters. The manner in which he illuminated his technical remarks with occasional touches of humour was delightful; and he enjoyed freedom to pursue his examination of metallurgical developments without having his mind occupied with purely administrative matters.

FUTURE OF THE METAL TRADE

"Disintegration" Through Government Action

In an address to the shareholders of Metal Traders, Limited, Mr. Frank L. Baer, the chairman, states that with the Ministry of Supply taking over the control and distribution of tin in addition to copper, lead and zinc, their trading in these metals has come to a complete standstill. Their business had already been seriously affected by the elimination of overseas trade, but the loss of their home trade, which has been acquired by, and passed entirely into, the hands of the Ministry of Supply without remuneration, constitutes a further serious loss directly attributable to Government action, which might have been avoided. The London Metal Exchange, as a body representing brokers and merchants, has never ceased to make representations to the Government either to utilise the organisation and experience of its members in the distribution of metals or to make provision for all those who have been put out of business through the present system of Government control. The Metal Exchange contends that as one firm only was employed to do the work of all for a remuneration, that remuneration should have been put into a pool for the benefit of all. So far, these representations have had no tangible results.

Though it is recognised that in a national emergency it is inevitable that some members of the community will be hit harder than others, the London Metal Exchange was a typical feature of the unique character of London as the world's financial centre and an example of one of the instruments by which she has been able to garner those payments for invisible exports which have been so important to the people of England. Economists of late have again been stressing the post-war importance of the export trade and the performance of services in order to secure invisible exports, and it therefore seems to Mr. Baer to show a lack of foresight to cause the disintegration of the metal distributing trade when with a little assistance that trade could have been kept in being to resume its useful function at the conclusion of the war.

Foundry Query.—A large concern is anxious to hear of any experience possessed by our readers in connection with the utilisation of anthracite as a fuel to replace coke in foundry practice.

SPARK TESTING OF STEEL SCRAP

Methods of identifying alloy steel scrap by a study of the characteristics of the sparks produced when the material in question is placed in contact with an abrasive wheel are described by L. P. TARASOV in "The Iron Age." Very little equipment is needed for this purpose—a portable grinder (preferably a light one), a pair of safety goggles, and a set of standard samples of steels of known composition.

The wheel should be hard enough to wear reasonably long and yet soft enough to retain a free-cutting face. A wheel, 1½ in. in dia. and ¼ in. thick, has been found to be satisfactory. The exact specifications of the wheel are not important, but it is best to keep to a single type of wheel once a suitable type is found, because the details of the spark stream are affected somewhat by the wheel specifications. In choosing a grinding wheel, it is important to make sure that when normal pressure is exerted the peripheral speed is at least 4,000 ft. per min.; otherwise the spark is shorter and duller than desirable.

A stationary grinder can be used just as well as the portable model in those cases where all the scrap is in pieces small enough to be handled conveniently without the necessity of cutting off samples, or where the scrap can be easily brought to the machine.

It is obvious that even a strong spark stream will be almost invisible in bright sunlight, but there is no need of going to the other extreme of spark testing in the dark. If the light where the spark testing is being carried on is too strong, as may be the case in a scrap yard, a few large screens of black cardboard or cloth will cut the light intensity down sufficiently. In general, diffused daylight and a fairly uniform background are all that is needed. Safety goggles should be worn for protection of the eyes. Lightly tinted ones are recommended when spark testis more or less continuous, but the ordinary untinted variety will do when only a moderate amount of testing is done.

Spark Identification

Of great importance in spark testing is a good set of specimens of known composition which will serve as standards both for learning to identify the various types of sparks and for comparison with scrap of unknown composition. Use of such standards is the only practical way of classifying scrap by means of the spark test. The more complete the collection of standards, the more closely and accurately can the scrap be classified.

The kinds of steel that should be represented in such a collection will depend on the nature of the scrap to be spark tested, but it should in any case include a set of plain carbon steels, as the spark due to carbon is generally the most pronounced feature in the spark stream.

Although many photographs and sketches of various spark streams have been published, they are not by themselves of much help in classifying steels. The difficulty lies in reproducing in black and white a very large number of rapidly moving and overlapping sparks, each of which may vary along its length in intensity, colour, and shape. Photographs are often quite misleading because they fail to show what the eye sees clearly and at the same time they bring out without any trouble what can hardly be detected visually.

Sketches usually have an even poorer resemblance to the spark stream and the best ones are those which are obviously schematic, drawn to call attention to some detail for which the observer should look when testing a sample of the steel. Hence, classification of scrap by spark testing can be done properly only by comparison with actual sparks of known standards and not by comparison with pictures of sparks.

Spark Stream Features

When a spark stream is studied carefully, it becomes apparent that it consists of a large number of sparks of various lengths which look alike except for size, all the details being roughly in proportion to the spark length. A spark is here understood to mean not only the main shaft or carrier line, but also any bursts and other details which may develop from it.

The details of a spark stream can often be seen better by reducing grinding pressure so that there are fewer overlapping sparks. Another place to look for details is in the occasional sparks which cling to the wheel for part of a revolution before being thrown off. In this case there is no background of sparks to obscure the details.

In classifying steel scrap, the alloying elements which are important, either because of current shortages or because of their influence on the spark stream, are carbon, manganese, nickel, chromium, molybdenum, vanadium and tungsten. Although the presence of some of these in the steel can be easily determined by the spark test, others may be much more difficult to detect. The effects described are limited to those which can normally be noticed by a person with but a moderate amount of experience in spark testing. The author exemplifies the application of the method by describing the spark characteristics produced by the various elements.

The Nickel Bulletin for May contains a particularly valuable table, setting out all the compositions of steels as standardised by the American Iron and Steel Institute and the Society of Automotive Engineers. Details are given of a new alloy for working at high temperatures; it is known as the Westinghouse K42 B alloy, and contains nickel, cobalt, titanium, iron and chromium, with minor amounts of other elements.

American Society for Testing Materials.—More than 100 technical Papers and reports were presented at the forty-fifth annual meeting of the American Society for Testing Materials, held at Atlantic City last month. There were more than 150 meetings of technical committees, and 18 separate technical sessions. The two outstanding technical features were a symposium on radiography, dealt with in three sessions, and a discussion on the solvent action of water vapour at high temperature and pressure.

MOULDED GEAR WHEELS

A Combined Stripping Plate and Cover Core

By Jas. Timbrell

The successful moulding of gear wheels, from loose patterns drawn out by hand, requires much practice; perfect "draws" are necessary if the teeth are to mesh evenly and run quietly in operation. The ideal combination is, of course, the mechanical draw, stripping plate and well-bonded sand. With an assortment of patterns and small repeat orders, this ideal is not always attainable on account of the expensive tackle and time taken to rig up.

This article discusses a development of the stripping plate and a cover core combined; being entirely "moulder-made," it requires little fitting or filing up prior to being put into service. The cast stripping plate ensures a perfect pattern draw, without rap, an assurance that the teeth are true to shape, and that the castings are true to pattern. The use of a cover print and top core converts the job into a "flat-back." The method is not confined to gear wheels, but is also applicable to any pattern carrying no taper, and so requiring skilful pattern drawing. To the foundry operating with semi-skilled or diluted labour the advantages of the process are many, and for women operatives this cover print stripping plate moulding is most useful.

If the details be carefully noted and the sequence of operations followed, a pattern-plate moulder will make a complete unit without difficulty.

For the purpose of easy description, a 12 by 9 pattern has been chosen. This is shown in Fig. 1, placed on thickness pieces, which control the ultimate thickness of the cover core proper. The pattern is set up dead square on a level plate. The ramming up —inside a wood box—with a well-bonded core sand is proceeded with in the usual way; it is rolled over on to a level core plate, and jointed down as shown in Fig. 2. The key, cut on the outside rim, an identification cross cut into one of the teeth, and a small spigot for a dowel, are worthy of note as these three items are important. They ensure correct register in subsequent routine. The actual tooth joint line should go a little below the pattern, to provide a tooth outline on the core, as is shown in Fig. 3.

After the jointing is complete, the pattern is withdrawn, the outside frame removed and the block mould dried and used as a corebox, after replacing pattern, three cores being made. For large diameter or heavy patterns this part of the process may be carried out in a moulding box and the three cores lifted out on core grids.

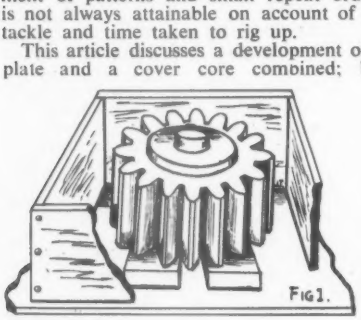

Fig 1.

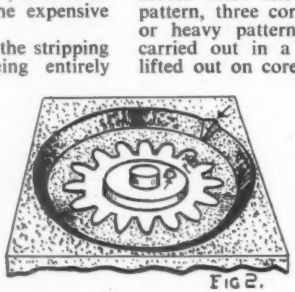

Fig 2.

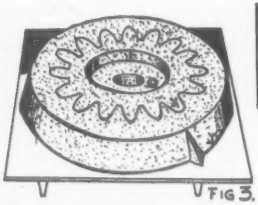

Fig 3.

Fig 5.

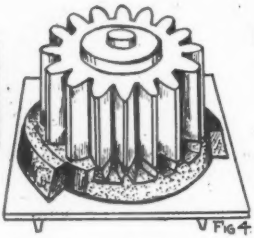

Fig 4

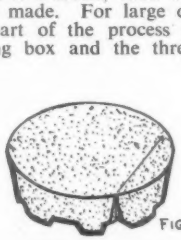

Fig 6.

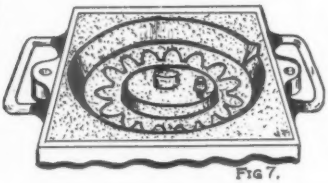

Fig 7.

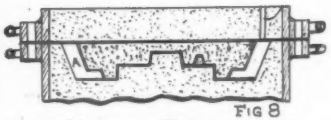

Fig 8

Any mending or tooling should be avoided on these cores, two of which should be dried hard and smooth. The pattern is placed in position on the third core, the dowel ensuring correct register. The space which forms the stripper is cut away round the base and tooth profile, as is shown in Fig. 4, wherein the key should be noted. The taper cut shown makes for easy filing later when the casting is fitted over the pattern. This cut-down core is dried and placed in an ordinary mould rammed up from one of the dried cores used as the pattern, as shown in Figs. 6 and 7. The dowel again ensures correct positioning. A flat top is rammed up to cover the mould shown in section at Fig. 8; the space A forms the iron stripper casting (Fig. 9). The high spots are filed away and the casting made to work smoothly up and down the pattern teeth.

Another mould is rammed up from the same core used as the pattern in the previous mould (Fig. 7), by filling in the spaces between the teeth and bottom

Moulded Gear Wheels

corner after this stripper casting has been placed in this mould. This is shown at B and by arrows in Fig. 10. A flat top is rammed up as before and two pieces of block core filed up to shape, to provide lifting bars and to lighten out this base part, as shown in Figs. 10 and 11. This mould is cast in pattern metal, and the gear wheel pattern secured to it after trimming (Fig. 11).

This unit is complete and rammed up in the usual way as a loose pattern, rolled over, and the gear wheel pattern drawn out through the stripper. The cast-iron stripper stays behind and is lifted out later (Figs. 11, 12 and 13). The cover core being placed in position completes the mould. The corebox to make the cover cores is made from the third core previously mentioned. The core is blacked smooth

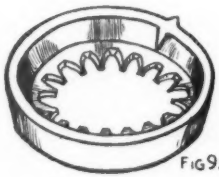
FIG 9.

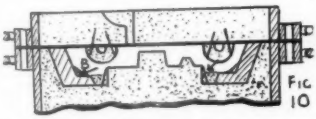
FIG 10

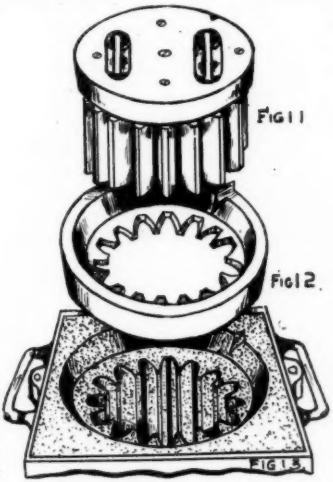
FIG 11

FIG 12.

FIG 13.

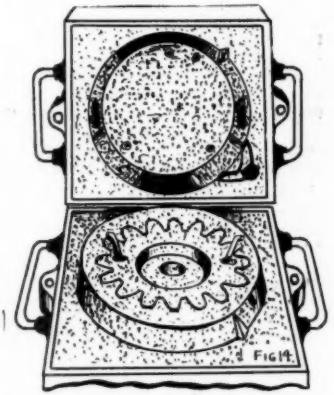
FIG 14.

all over, and fastened down onto a flat back mould, as is shown in Fig. 14. Thickness pieces, ¼ in. more or less, are placed all over, and a top part rammed up. This top part is trimmed away to shape. Two hand lugs are cut into the outside rim for lifting purposes, and three short spigots of the trowel handle type are made to eliminate the "rock" when in use. It will be noted that the spigot dowel shown in Fig. 3 is stopped off, the mould is closed and cast in iron to ensure a similar contraction to the stripper ring.

Zinc Bearings.—The new Al and Cu bearing zinc alloys with additions for preventing corrosion and premature ageing have given a considerable impetus to the use of zinc in bearings, state E. SCHMID and R. WEBER in the "Zeitschrift des Verein deutscher Ingenieure." Extensive tests have shown that these alloys are equivalent to white metal and copper bearings, even under high stresses.

CENTRAL AND SOUTH AMERICAN RESOURCES

Central and South America, notably Brazil, possess appreciable resources of non-ferrous metals, etc. Brazil has large unworked copper deposits and its present output of bauxite ore makes the country one of the leading producers. As to chrome ore, Brazil is the second largest producer in the Western Hemisphere, and although the output cannot at present be considered high, it is increasing rapidly under the stimulus of United States' purchases for military requirements. Brazil's chrome ore reserves are estimated at 4 million tons, and in the State of Bahia alone there is an estimated 400,000 tons of available surface chrome ore. Central and South America supply about 99 per cent. of the beryllium that the American steel alloy industries require, and about half the supply comes from Brazilian mines, which are capable of much greater exploitation. In manganese, Brazil competes with Cuba as the Western Hemisphere's first producer; it has large deposits and output has been increased fivefold since the beginning of the war and is being stepped up considerably. In the State of Ceara, Northern Brazil, are magnesite deposits capable of supplying for export about 150 metric tons of calcined magnesite monthly; with a small amount of additional work this output could be increased to about 1,000 tons a month. Brazil produces an important amount of high-grade mica, ranking fifth in world production, and there are also large deposits of graphite, which have not been well studied. Of all the American republics, Brazil is the only considerable source of titanium ore; it is the world's third most important producer of zirconium, supplying the United States with 47 per cent. of its total import requirements of this mineral; and there are important Brazilian nickel deposits of rich content estimated at 10 million metric tons, but at present these are only in the category of potential resources.

BRAINS TRUST QUERIES—I

At a meeting of the London Branch of the Institute of British Foundrymen, held at the National Liberal Club, London, on Thursday, April 30, a number of questions on foundry and metallurgical problems, submitted by members of the Branch, were dealt with by a Foundry and Metallurgical Brains Trust, composed of Dr. C. H. Desch, F.R.S., and Mr. E. Longden, M.I.Mech.E. (guest-participants), Dr. A. B. Everest and Mr. C. H. Kain (past-Presidents of the Branch), Mr. A. J. Murphy (Branch-Vice-President) and Mr. McRae Smith. The Branch-President (Mr. R. B. Templeton) presided as question-master. A report of the questions and replies will be published in instalments, owing to pressure on our space.

Question 1.—*Why does a piece of pig-iron or steel scrap float on molten cast iron?* (From Mr. F. Hudson.)

MR. LONGDEN questioned that steel scrap would necessarily float on molten cast iron, but a piece of pig or scrap iron, if of ordinary grey-iron composition, would float on molten cast iron of grey-iron composition, because it is lighter than the fluid metal owing to the greater voids and graphite in the solid pig-iron or scrap due to the growth of graphite.

DR. EVEREST said the answer to the question turned entirely upon whether the specific gravity of solid iron was greater or less than that of molten iron, and he ventured to suggest that we did not know the answer, owing to the great difficulty of measuring the specific gravity of molten pig-iron. A certain amount of work had been done on the subject, but the practical difficulties were many, and he did not believe there was yet a satisfactory answer.

MR. MCRAE SMITH suggested that the specific gravity of liquid cast iron, certainly just before the temperature was reduced to the freezing point, was less than that of ordinary solid grey cast iron, and the same conclusion also held good for solid white cast as compared with liquid cast iron. His explanation of the phenomenon of floating was that there was not a great deal of difference between the gravities or densities of the solid and the liquid, but that, owing to the high viscosity and very poor wetting properties of the liquid cast iron, the solid was not able to break down the surface tension. Therefore, it floated.

DR. DESCH agreed with Mr. McRae Smith that it was essentially a surface tension effect which enabled the solid metal to float. It was difficult to determine the actual density of both solid and liquid cast iron at and near the melting point; but it had been determined in the case of steel—it had been done in his laboratory—and there was no doubt that the solid was more dense than the liquid at that point.

The BRANCH-PRESIDENT said the fact that a needle would float on water provided perhaps another example of the effect of surface tension.

MR. MURPHY suggested that the truth of that explanation could be verified by the experiment with the flux on the top of molten cast iron, because there was an up-turned meniscus.

MR. HUDSON did not agree, because, if it were pushed down to the bottom, it would come up again.

Question 2.—*Why does molten cast iron, when running from the furnace, scintillate more the lower the silicon content?* (From Mr. J. L. Francis, Ipswich.)

MR. KAIN suggested that it was a question of oxidation. With a much lower silicon content, there was a much greater proportion of oxidised iron present, which flew away from the surface of the metal as it flowed over.

DR. EVEREST said that, as the temperature of the metal was falling, oxygen would be given off to some extent, and a greater volume of oxygen would have to be given off in the case of the lower-silicon iron than from the higher-silicon iron. That would result in the scintillation effect.

MR. MCRAE SMITH said he had always thought that the manganese content of the cast iron had a great deal more to do with the scintillation than had the silicon content, although it was quite true that the low-silicon irons scintillated and sparked more than the high-silicon irons.

MR. LONGDEN suggested that the higher the iron content of the metal the greater the tendency of the splashes to burn. In that connection he pointed to the process of the oxygen cutting of steel, and said that the purer the steel or the higher the iron content of the metal the more easily was the process carried out.

The QUESTION-MASTER (Mr. R. B. Templeton) said the dictionary described the word "scintillate" as throwing off sparks. He felt that Mr. Longden's suggestion was nearest to the truth. The sparking was the burning of the iron—not only of the carbon and silicon, but of the iron itself—the sparks being very minute. The sparks from an emery wheel provided an analogy.

DR. DESCH wondered if it were possible that, in the case of a high-silicon iron, the oxidation of the silicon in the air, in combination with the oxide of iron already there, coated the stream with a very thin layer of slag which protected it against burning. He was not prepared to say that that was so.

MR. MURPHY pointed out that low-silicon iron required to be poured at a higher temperature than high-silicon iron, and the iron burned more readily at that higher pouring temperature.

Effect of Fe on Al Alloys.—In investigations by K. L. DREYER and H. SEEMANN, reported in "Metallwirtschaft," on the effect of from 0.28 to 1.32 per cent. Fe on the hardening of Al alloys containing 4.1 per cent. Cu, 0.6 Mn, 0.8 Mg and 0.3 Si, it was established that up to 0.5 per cent. Fe the mechanical properties are only slightly affected, but that at higher Fe values the adverse effect much increases.

WASTE PAPER IS A RAW MATERIAL

CUPOLA-MELTED HIGH-DUTY CAST IRONS

Written Discussion

An additional contribution to the discussion on Mr. W. W. Braidwood's Paper of the above title, which was recently read at meetings of various Branches of the Institute of British Foundrymen (see THE FOUNDRY TRADE JOURNAL for May 14, 21 and 28), has been made in written remarks from MR. A. SUTCLIFFE, to which Mr. Braidwood has replied in writing.

MR. A. SUTCLIFFE wrote:—

"Mr. Braidwood has shown us how to obtain a perfect iron, but this does not provide us with the means of producing perfect castings. It is impossible to do this without the aid of the skilled practical moulder who does the job on the foundry floor. The lecturer said that he was not a practical foundryman, and it may be that he does not fully appreciate this fact. It is possible for one to see, side by side on a scrap heap, castings which have been broken up after a hundred years of service and others which have been scrapped after only a few weeks. This shows that, despite all the improvements claimed to have been made by chemists and metallurgists, present-day castings compare unfavourably with those of the past. Cast irons cannot be regulated by reference to analysis alone, and pig-irons of similar composition may have quite different fractures and may give quite different results when melted and used to pour castings.

"There is nothing new about melting steel in a cupola; my grandfather did that! Regarding the temperatures quoted, if the temperature of the metal at the spout is 1,430 deg. C., what must it be in the melting zone? I have never known any cupola-melted metal to have a temperature in excess of 1,400 deg. C. The castings which were sketched by the lecturer to illustrate his remarks on production procedure were of such simple type that no great skill would be required in their manufacture.

"It has been said in recent years that the time has now come for the practical man to kneel down to the man of science. But science cannot work by itself, and castings are not produced by the metallurgist in a laboratory. The young man of to-day starts where the older man leaves off, and it is very unlikely that he will improve on the standard of the past forty years."

MR. BRAIDWOOD wrote the following in reply:—

"It is gratifying to have this contribution to the discussion of my Paper. It would have been an unique event, and, I think, an unflattering one, had any representative of the technically-trained younger school been allowed to speak in the presence of the indefatigable Mr. Sutcliffe with impunity. At the outset, a wrong impression must be corrected. My modest statement to the effect that I was not a practical foundryman was really intended to mean that I made no claim to being a moulder. I most certainly am, however, a practical foundryman. Since leaving school I have worked in, thought of, and lived for, foundries almost exclusively. My main laboratory has always been the foundry and my first consideration the actual production of castings. (Possibly Mr. Sutcliffe is already softening towards me!)

"We may now deal with the questionnaire, point by point. The first sentence contains a rare compliment, and surely my questioner will admit that an essential in the production of first-class castings is the preparation and supply of suitable metal. Nevertheless, the metallurgist who would decry the importance of the craftsman is no less a fool than the moulder, however skilled, who sees no justification for the existence of the metallurgist. The rôle of the writer is, and always has been, that of helpful colleague to the man on the floor, and if this Paper has indeed shown how irons of improved type may readily be made available in the foundry, then its object has been achieved.

"The thoroughly practical Mr. Sutcliffe, moreover, seems singularly unappreciative of the thoroughly practical nature of the Paper under discussion. This is no academic treatise describing small-scale laboratory experiments, but a comprehensive report of the results of actual foundry operations, all capable of ready interpretation and duplication by the interested foundryman. Therein lies the chief virtue of the work described.

"Mr. Sutcliffe's contention that present-day castings compare unfavourably with those of last century is a blatant fallacy which I am delighted to expose, and the 'evidence' which he quotes is simply laughable. What sort of engines were being made a hundred years ago, Mr. Sutcliffe? Is it not correct to say that by modern standards they were slow-running, massively-designed assemblies required to perform duties which the engineer of to-day would dismiss as trifling? It would be no more illogical to contend that since she is still afloat, Nelson's 'Victory' is a better ship than was the 'Mauretania,' long since broken up.

"My questioner now leads his ace of trumps: 'Cast irons cannot be regulated by reference to analysis alone . . . etc.' Show me, Mr. Sutcliffe, the metallurgist who maintains that they can! Surely, Dr. Norbury, formerly of the British Cast Iron Research Association, has spared no effort to demonstrate the truth of what you say, to explain the reasons for such apparently inexplicable differences in structure and properties, and to help in solving the difficulties of the foundryman in that respect. And is it not the case that my Paper stresses the fact that irons of similar analysis can exhibit vastly different structures and properties? (You really can't have been listening, Mr. S.—apologies to Quentin Reynolds.)

"Grandpa Sutcliffe must have been a progressive young chap. It is very probable that he was gravely warned by the old-timers of 1850 or thereabouts that dark days were in store for the foundry industry when rash youngsters such as he were left to look after things.

"It is fairly certain that, unless Mr. Sutcliffe has himself successfully melted all-steel charges, using adequate coke, he has indeed never seen cupola-

Cupola-Melted High-Duty Cast Irons

melted metal quite as hot as that reported. One of the points made in the Paper is that steel melts in the cupola as steel, that is, at temperatures in the region of 1,500 deg. C., and the relationship observed to exist between the percentages of steel charged and the spout temperatures obtained lends support to this conclusion. All of the temperatures quoted are actual readings, uncorrected, determined by the use of a Cambridge Optical Pyrometer of the disappearing filament type. Each audience was so informed, and every listener advised that the quoted temperatures should not be too promptly compared with those reproduced in other Papers or obtained in other foundries, yet it seems that, once again, Mr. Sutcliffe was not listening.

"When asked to give advice on the actual manufacture of high-duty iron castings, I first discussed certain characteristics of low-carbon irons, and then made specific recommendations with regard to production technique. These remarks were illustrated by blackboard sketches showing castings of simple type, chosen deliberately, since they allowed my points to be explained with the greatest clarity and, I believe, with fair success. While it is indeed the case that the bulk of our present output of high-duty iron castings is of such simple type, we have also made sound castings of fairly intricate type in both green sand and dry sand moulds, and the principles which were expounded hold good for castings of any sort.

"Surely no branch of foundry activity is ever obliged, or even expected, to 'kneel down' to another; yet never at any time was there greater need than now for the fullest possible co-operation among all sections of the foundry industry. It is only natural that with the old foundryman, as with the old cricketer or footballer, distance should lend enchantment to the view. It is disappointing, however, to find that this particular veteran, when turning to cast his gaze forward, should discard his spectacles of rosy tint for lenses of vivid red and see only danger ahead. Like the Immortal Bard in his most pessimistic mood, our fiery heckler groans 'An' forward, tho' I canna' see, I guess an' fear.' (What Scotsman can resist quoting Burns?)

"Fortunately, however, Mr. Sutcliffe's is an exceptional case. Among my own friends and associates I am happy to number many veteran foundrymen. These grand old men, though proud of the past, find pleasure in the present and have faith in the future."

BEARINGS CONTROL ORDER

To secure the most equitable distribution for production purposes of ball and roller bearings, and to prevent overstocking of such bearings, the Ministry of Supply has issued an Order which came into force on July 22 controlling the acquisition and stocking of bearings.

NEW PATENTS

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each.

544,699 BERNSTEIN, L. Apparatus for removing dust from air or other gases.

544,717 LAZENBY, T., and FRANCOIS CEMENTATION COMPANY, LIMITED. Cast hard metal alloys.

544,719 AKT.-GES. BROWN, BOVERI, & CIE. Plants for producing a mixture of hot air and combustion products under pressure.

544,777 RANKIN, F. W., and PRIESTLEY, J. W. Machines for seaming sheet metal containers.

544,790 FOSTER WHEELER, LIMITED. Method of and means for disposing of ash in the furnaces of vapour generators.

544,858 AEBERHARDT, E. Process for the production of cast iron alloys, such as grey cast iron alloys, malleable cast iron alloys, or pig-iron alloys.

544,860 LINDE AIR PRODUCTS COMPANY. Method and apparatus for desurfacing, severing, and like operations on ferrous metal bodies involving the combustion of metal.

544,888 GLACIER METAL COMPANY, LIMITED, BROWN, W. B. D., and HOLLIGAN, P. T. Bonding of metals.

544,917 DEUTSCHE WAFFEN-UND MUNITIONS-FABRIKEN AKT.-GES., and ENGLER, O. Method and apparatus for the demagnetising of small steel bodies.

544,969 GENERAL MOTORS CORPORATION. Porous metal articles, and methods of making the same.

544,974 BRITISH THOMSON - HOUSTON COMPANY, LIMITED. Method of and apparatus for forming rods, tubes, and like articles by extrusion.

545,006 CASTINGS PATENT CORPORATION, and HAGEMEYER, H. F. Making of metal-casting moulds.

545,023 GLACIER METAL COMPANY, LIMITED, and HOLLIGAN, P. T. Bonding of metals.

545,042 CASTINGS PATENT CORPORATION, and HAGEMEYER, H. F. Making of metal-casting moulds.

545,057 MEHL, E. Deposition of iron powder.

545,102 MOND NICKEL COMPANY, LIMITED. Cast iron.

OBITUARY

MR. FREDERICK MOORE, senior partner in the firm of W. H. Moore & Sons, metal rollers, of Birmingham, died recently, aged 74.

MR. FRANCIS MOORE WHITEFIELD, of the Birmingham Welding Company, Nechells, died suddenly on July 13. He was in his 60th year.

MR. LLEWELLYN JOHN died at his home at Llanelly recently at the age of 71. He was chairman of the Bynea Steel Works, Limited, and of the Dafen group of tinplate and steel works, which operate about 30 sheet and tinplate mills. Educated at Christ College, Brecon, he began his career with the Ashburnhim Tinplate Company, Burry Port, and in 1912 formed the Gorse Galvanising Company, Dafen, and the Bynea Steel Works, Limited.

NEWS IN BRIEF

MR. S. SIMPSON, late of Taikoo Dockyard, Hong Kong, and a member of the Institute of British Foundrymen, recently addressed a meeting of the Institute of Australian Foundrymen on "Notes on Foundry Practice."

SOUTH WALES METAL REFINERS, LIMITED, 11, Queen Victoria Street, London, E.C.4, are paying a first and final dividend of 8s. 7 13/20d. in the £, payable at the office of the Official Receiver and Liquidator, Bankruptcy Buildings, Carey Street, London, W.C.2.

ENGINEERING BULLETIN No. 13 (June) issued by the Ministry of Labour and National Service, contains an illustrated article dealing with the employment of women in foundries. It is stated that "no protracted training is required for foundry work, and except in actual moulding a woman becomes reasonably efficient within a fortnight."

TO ENCOURAGE the production of wolfram by individuals and small groups of workers, the Ministry of Supply are prepared to arrange to purchase small quantities of rough concentrates of an assay value down to 10 per cent. WO_3, on the basis of a price of 100s. per unit of WO_3 as 65 per cent. clean concentrates, less certain charges, and less an allowance for low-grade material.

MR. JESSE JONES, U.S. Secretary of Commerce, recently stated that annual production of aluminium in America would reach 1,000,000 short tons when all plants have been finished, compared with a production of 150,000 tons two years ago and 270,000 tons a year ago. The present rate was about 500,000 tons per year. The current programme would result in the annual production of 300,000 tons of magnesium compared with 16,500 tons a year ago. The Reconstruction Finance Corporation has contracted to buy 685,000 tons of aluminium from Canada, and has bought 760,000 tons of copper from Latin-America.

MILLED WHEATEN SUBSTANCES FOR CORE BINDERS, etc.

The attention of manufacturers of core binders, etc., is again drawn to the provisions of the Milled Wheaten Substances (Restriction) Order, 1940, which prohibits, except under licence, the purchase, sale or use of any milled wheaten substance for any purpose other than the manufacture or preparation of any article of food.

The expression "milled wheaten substance" includes all types of wheat flour, whether home milled or imported (*i.e.*, white flour, National flour, all speciality flours, flour-sack shakings and flour sweepings), and all wheat by-products (*i.e.*, fine and coarse wheatfeed or bran).

Foundries and foundry suppliers desiring to sell, buy or use milled wheaten substances in whatever condition or quantity for purposes other than human food should apply for a licence to the Cereal Products Division, Mount Stewart, Colwyn Bay. Infringements of this Order are offences against the Defence (General) Regulations, 1939.

PERSONAL

MAJOR PETER LAIRD, son of Mr. J. W. P. Laird, director of Cammell Laird & Company, Limited, is reported missing in the Middle East.

MR. ASHLEY S. WARD has received from the staff and workpeople of Thos. W. Ward, Limited, Sheffield, and subsidiary and associated companies, a miniature portrait of his wife, who was Mistress Cutler from 1939 until her death in February this year.

MR. JAMES B. MACOUAT has been appointed chairman of the Rivet, Bolt & Nut Company, Limited, Glasgow, in succession to the late Mr. William Crosher. Mr. Macouat thus assumes a position occupied by his father, the late Mr. R. B. Macouat, who was the chairman of the company from 1904 until 1920.

LIEUT.-COMMANDER E. BASIL GREEN, R.N., assistant managing director of the Royal Doulton Potteries, has been appointed Deputy Regional Commissioner for Civil Defence in the South-Eastern Region. Lieut.-Commander Green served as Staff Officer to Capt. Lord Monsell, R.N., in 1939/40. He was released from active service, at the request of the Ministry of Supply, to return to his company to deal with production.

Wills

SCOTT, G. J., chairman of Laurence Scott & Electromotors, Limited £47,609

HUGGINS, F., of Lapworth, Warwick, retired tube manufacturer, director of the Britannia Tube Company, Limited, Birmingham, formerly a director of Simplex Conduits, Limited, Oldbury £544,341

DAVID BROWN & SONS (HUDDERSFIELD)

As a result of negotiations between Mr. David Brown and the Ministry of Supply, the following appointments have been made to strengthen the boards of David Brown & Sons (Huddersfield), Limited, and David Brown (Tractors), Limited:—Mr. S. S. Hammersley, M.P., has, at the request of the Ministry of Supply, accepted the chairmanship of both companies without remuneration. Mr. T. C. Guthrie, C.A., and Mr. Robert Officer have become directors of David Brown (Huddersfield), Limited, and Mr. Officer has also joined the board of David Brown (Tractors), Limited.

NO BUILDING LICENCE FOR "PROCESS STRUCTURES"

The Ministry of Works and Planning announces that owners of foundries, coke ovens, blast furnaces, etc., are not required to apply for a building licence under Defence Regulation 56A (S.R. & O., 1941, 1596) for the erection, repair, relining and maintenance of blast furnaces, coke ovens, brick and lime kilns, and other "process structures."

COMPANY NEWS

(Figures for previous year in brackets.)

Mather & Platt—Interim ordinary dividend of 4% (same).

Humphreys—Profit for the year to November 30, 1941, £72,723 (£42,370); ordinary dividend of 10% (same).

Crossley-Premier Engines—Profit for the year to April 30 last, £46,042 (£42,897); dividend of 10% (same).

Darlington & Simpson Rolling Mills—Dividend of 7½% for the year ending March 31 on the ordinary shares.

Hick, Hargreaves & Company—Net profit, after tax, for the year to March 31 last, £31,815 (£27,063); dividend of 10% (7%); forward, £7,403 (£6,987).

Harland & Wolff—Net profit for 1941, £187,716 (£297,825); dividend on the "A" and "B" ordinary shares of 6% (same), £209,882 (£194,282); forward, £74,268 (£98,434).

Mirrlees, Bickerton & Day—Net profit for the year to March 31, after providing for depreciation, E.P.T., income-tax, etc., £18,784 (£14,821); ordinary dividend of 6% (same); forward, £7,262 (£7,128).

Davey Paxman—Profit for year to March 31, £30,808 (£26,732); tax, £15,779 (£11,000); ordinary dividend of 7½% (15%); to reserve for post-war losses and other contingencies, £3,000 (£2,444); to general reserve, £3,000 (nil); forward, £7,954 (£7,819).

Coghlan Steel & Iron—Profit for the year ended March 31, after providing for depreciation and taxation, £6,132 (£7,560); war damage contributions, £561; preference dividend, £1,375; participating dividend on the preference shares of 1½%; dividend on the ordinary shares of 10% (same); to reserve, £1,000; forward, £9,373.

Briton Ferry Steel—Net revenue for the year to March 28 last, after charging war damage insurance and A.R.P. expenditure, but before making provision for taxation, £205,544 (£221,298); staff bonus fund, £4,640 (£5,847); depreciation, £40,000 (same); to reserve for additions, improvements, etc., £20,000 (£41,768); taxation and contingencies, £90,000 (£80,000); dividend on the ordinary shares of 10% (same); forward, £48,379 (£49,823).

Guest, Keen & Nettlefolds—Net trading and other profits, £1,203,678 (£1,165,507); debenture interest, £56,087 (£57,829); debenture redemption, £38,967 (£39,310); depreciation, £250,000 (£200,000); net balance, £858,624 (£868,369); war damage insurance, £46,000 (£40,000); war contingencies, £50,000 (£60,000); to reserve, £100,000 (same); final dividend on the ordinary shares of 6% (2½% net), making 10% (5%, tax free); forward, £495,458 (£482,437).

John Lysaght—Profit for 1941, after providing for debenture interest and war damage insurance, and including dividends from investments and subsidiary companies, £465,859 (£533,636 before £32,500 to war damage insurance); brought in, £336,994, of which £100,000 is transferred to contingencies; to reserve for depreciation and obsolescence, £120,000 (£100,000); dividends on the preference and second preference shares, £36,000 (same); dividend of 3s. (3s. 6d.) per share, free of tax, on the ordinary shares.

General Electric Company—Profit on trading and income from investments, after providing for E.P.T., £1,725,137 (£1,722,643); depreciation, £460,795 (£444,598); war contingencies, nil (£50,000); directors' fees, £4,485 (£5,064); pension fund, £78,911 (£69,313); net profit, £1,180,946 (£1,153,668); to income-tax reserve, £685,000 (£650,000); dividends on the 6½% "A" preference stock, £58,500 (£62,888); dividends on the 7½% "B" preference stock, £67,500 (£72,562); dividend on the ordinary stock of 10% (same), £209,919; bonus of 7½% (same), £157,439; forward, £815,379 (£812,791).

NEW COMPANIES

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Peter Bassett & Company, 130, High Holborn, London, W.C.1—Engineers, etc. £3,000.

Andrewes Brass Foundry, General Buildings, Wellington Street, Leicester—£2,000. E. F. James and F. Johnson.

Forson Design & Engineering Company—£4,000. F. G. Forfitt, 11A, Hillside, Southwick; C. K. P. Morriston, and H. G. Warner.

D. B. Controls, Whinmoor Road, Wincobank Avenue, Shiregreen, Sheffield—Ironfounders, engineers, toolmakers, etc. £500. J. T. Hall, C. E. Evans and S. Phillips.

Fred Gilbert (Cardiff), 7, St. Andrews Crescent, Cardiff—To take over the business of engineers carried on at Canal Parade, Cardiff, by F. W. Gilbert. £2,500. F. W. Gilbert.

Berry & Dewhirst, Limited—To take over the business of an ironfounder and patternmaker carried on at Progress Ironworks, Newgate, Mirfield, as "A. Dewhirst & Company." £3,000. E. and W. Dewhirst, T. Berry, senr., and T. Berry, junr.

Anderson & Field, 60, Garfield Street, Watford, Herts—To take over the business carried on at Watford, as "Anderson & Field." Ironfounders, engineers, etc. £3,000. J. P. Anderson, S. W. Field, A. W. Viles, and W. H. D. Bond.

NEW TRADE MARKS

The following applications to register trade marks appear in the "Trade Marks Journal":—

"MORREX"—Wire brushes. B. O. Morris, LIMITED, The Woodlands, Tythe Barn Lane, Shirley, Birmingham.

"KANTHAL" (Device)—Heat-resisting iron and steel alloys. AKTIEBOLAGET KANTHAL, c/o Marks & Clerk, 57 and 58, Lincoln's Inn Fields, London, W.C.2.

THE INSTITUTE OF MARINE ENGINEERS announces that the Herbert Akroyd Stuart Award, value £50, is open to members or non-members for the best Paper on the "Origin and Development of Heavy Oil Engines" submitted to the Council during the two years ending April 30, 1943.

STANTON

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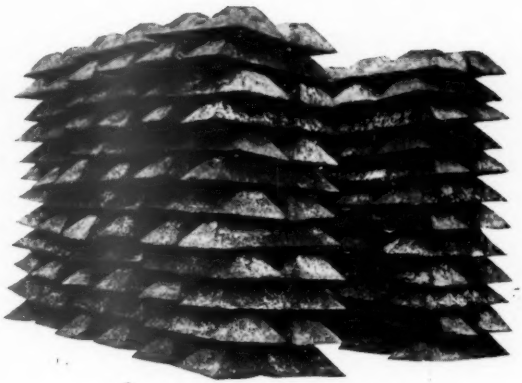

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Holidays are usually taken in the iron and steel industry about this time of the year, but on this occasion lost time and production will be greatly reduced, as at many establishments workers have voluntarily agreed to forgo their annual rest period. Their generosity is appreciated and will represent a substantial tonnage of iron and steel, but, whatever the degree of co-operation between the employers and workers, the necessity for plant overhauls cannot be entirely eliminated, and a certain amount of lost time is being recorded on this account. In the long run, of course, the output sacrificed in this way is more than made up, as systematic repair work carried out periodically permits operations to continue unhampered by breakdowns. There is urgent need for every ton of iron and steel which can be produced, and it is gratifying to note the excellent level of output which is being returned throughout the industry. Developments in a number of directions have, in fact, been far more satisfactory than had been anticipated.

Wartime demands on the foundry industry are largely centred on the products of the heavy branches. There has been a big slump in the demand for light castings for normal purposes since the outbreak of the war, and the needs of supply departments have not been sufficient adequately to compensate makers for losses of trade in other directions. Nevertheless, castings for the equipment of Army huts, etc., continue to be in fair demand and, despite the absence of much ordinary domestic business and export trade, the position might well be worse. Heavy engineering and speciality foundries are operating to capacity on important contracts and are rarely able to accept other than Government business.

Foundry pig-irons are being delivered quite freely, high-phosphorus iron being especially easy to obtain. Supplies of the better-quality irons are not forthcoming so readily, and are being carefully distributed under the eagle eye of the Control authorities. Hematite, generally speaking, can only be procured when no alternative grade is available, while low-phosphorus iron is also somewhat difficult to acquire. Medium-phosphorus iron is delivered fairly promptly, while refined iron comes forward quite well, although the position with regard to the latter grade has become a little tighter of late. High-phosphorus iron is being utilised wherever possible in the heavy foundries as a wartime expediency and the results have not been unsatisfactory.

While the steel production of British works has been expanded satisfactorily to meet the much-increased requirements of the various Government departments, it is still necessary to supplement home outputs with imports from the United States. In view of the difficult shipping position, every effort is, of course, being made to curtail these imports to the smallest possible amount, as shipping space is needed for more urgent purposes.

NON-FERROUS METALS

Satisfactory progress is reported in the efforts to expand tin production in Cornwall. One of the main obstacles at the outset was that of man-power, but the shortage of suitable labour has been relieved by the release of ex-miners from the Army. In addition, Dominion troops with mining experience now in this country have volunteered to work in the Cornish mines, and are rendering valuable assistance.

Civilian consumption of lead has been drastically curtailed in this country and ample supplies are coming forward to meet the requirements of war industries and other essential users. In several directions lead is being utilised as a substitute for tin. Ordinary uses for lead, such as the manufacture of batteries, cables, etc., are accounting for large tonnages of the metal. Lead consumption in the United States has fallen away appreciably of late, following the introduction of stringent economy measures. Consumption in June is estimated at around 57,000 short tons, compared with 75,000 tons in May and 85,000 tons in April. Copper and zinc continue to be readily forthcoming for war purposes on both sides of the Atlantic, and any surplus is prudently placed to reserve, non-essential use of any of the non-ferrous metals being severely discouraged.

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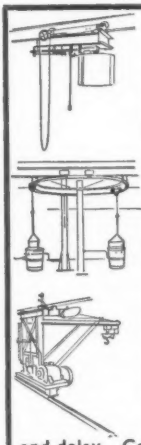

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